WE CLAIM:

1. Phase recovery filtering techniques for SCP throughput shortage comprising the steps of:

collecting throughput impact data at a lower sampling rate;

examining current sampled-data control system stability margins;

evaluating stability margins under a new slowed-down sampled-data system;

modeling a sampler and a zero-order-hold device in a z-transform;

inverting the slowed-down sample data device model as a new filter compensation; and

recomputing the control system stability margins to verify a recovered phase loss.

2. The phase recovery filtering techniques for SCP throughput shortage of claim 1 wherein, the lower sampling rate is 8 RTI.

3. The phase recovery filtering techniques for SCP throughput shortage of claim 1 wherein, the stability margins are gain and phase.

4. The phase recovery filtering techniques for SCP throughput shortage of claim 1 wherein, the slowed down sample data system is 8 RTI and 4 Hertz.

5. The phase recovery filtering techniques for SCP throughput shortage of claim 1 wherein, the new filter compensation is a phase recovery filter.

6. The phase recovery filtering techniques for SCP throughput shortage of claim 5 wherein, the phase recovery filter is a reciprocal of a first

order sampler and hold approximation.

7. The phase recovery filtering techniques for SCP throughput shortage of claim 1 wherein, the phase recovery filter interrupts 8 RTI data as 4 RTI data.

8. A method of phase recovery filtering techniques by collecting throughput data in a spacecraft computer processor (SCP) comprising the steps of:

providing the throughput data from an attitude control subsystem (ACS);

examining current sampled-data control system stability margins;

evaluating stability margins under 8 RTI and 4 Hertz;

modeling a sampler and a zero-order-hold device in a z-transform;

inverting the stability margins as a new filter compensation; and

recomputing the control system stability margins to verify a recovered phase loss.

9. The method of phase recovery filtering techniques of claim 8, wherein said phase recovery filter technique has an improved phase margin.

10. The method of phase recovery filtering techniques of claim 8, wherein a continuous domain first-order approximation of sample-data ACS is made.

11. The method of phase recovery filtering techniques claim 8, wherein a basic phase recovery filter structure is modeled from an approximation from the sampler and a zero-order-hold device.

12. The method of phase recovery filtering techniques of claim 8,

wherein the phase recovery filter maintains continuous attitude control executive.

13. The method of phase recovery filtering techniques of claim 8, wherein the attitude control subsystem is a sampled-data control system.

14. The method of phase recovery filtering techniques of claim 13, wherein said sampled-data control system employs a sampler and hold device.

15. A method of processing data from real time interrupts in a computer system comprising steps of:

collecting data at a first sampling frequency;

determining system characteristics based on the data;

evaluating stability margins under new slowed down sampled-data systems;

modeling sampler and a zero-order-hold device in a z-transform and inverting the model data as a new filter compensation; and

recomputing the control system stability margins to verify a recovered phase loss.

16. The method of processing data from real time interrupts of claim 15, wherein the sampler and hold device is realized as a zero-order-hold function.

17. The method of processing data from real time interrupts of claim 15, wherein said sampler and hold function generates a first-order approximation of the fundamental sampled-data system.

18. The method of processing data from real time interrupts of claim 15, wherein pure sampling effects at a crossover are minor with the first order

approximation.

19. The method of processing data from real time interrupts of claim 15 wherein a 4 RTI (8hz sampling) ACS is required to maintain proper stability margins.

20. A method of decreasing the processing time in a spacecraft computer processor (SCP) on-board a spacecraft by using a phase recovery filtering technique to prevent SCP throughput shortage, comprising the steps of:

collecting a dispatch sequence at a rate of 8 real clock-time interrupts (RTI);

examining present sampled-data control system gain and phase;

evaluating gain and phase under both a 4 RTI and an 8 RTI sampled-data systems;

modeling a sampler and a zero-order-hold device in a z-transform approximation of a first-order approximation with

$$Sampler + ZOH = \frac{z+1}{2z}$$

where s=2(z-1)/(T(z+1)) and is a Tustin transform,

where T = a sampling period of 4 RTI or 8 RTI.

inverting the slowed-down sample data device model, the model is a phase recovery filter with

$$Phase\,\mathrm{Re}\cos\,eryFilter = \frac{2z}{z+1}.$$

; and

recomputing the control system stability margins of gain and phase to verify a recovered phase loss.

21. The method of decreasing the processing time of an SCP in claim 20 wherein the dispatch sequence comprises midground processing, command

and telemetry, attitude control executive and real-time executive.

22. The method of decreasing the processing time of an SCP in claim 20 wherein the phase recovery filter takes back the loss coming from a longer sampling period of 8 RTI.

23. The method of decreasing the processing time of an SCP in claim 20 wherein the phase recovery filter recovers the phase stability margin.

24. The method of decreasing the processing time of an SCP in claim 20 wherein a basic phase recovery filter structure is derived from an approximation by the sampler and a zero-order-hold device.

25. The method of decreasing the processing time of an SCP in claim 20 wherein the phase recovery filter can be reprogrammed.